SOLAR/1045-79/03

Monthly Performance Report

MONTECITO PINES

MARCH 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

MONTHLY PERFORMANCE REPORT

MONTECITO PINES

MARCH 1979

I. SYSTEM DESCRIPTION

The Montecito Pines site is an apartment complex in Santa Rosa, California. It consists of one instrumented unit containing eight apartments. Each apartment has approximately 864 square feet of conditioned space. Solar energy is used for space heating and preheating domestic hot water (DHW). The solar energy system which serves the 8-apartment unit has an array of flat-plate collectors with a gross area of 950 square feet. The array faces 22 degrees west of south at an angle of 45 degrees to the horizontal. Water is the transfer medium that delivers solar energy from the collector array to storage and to the space heating and hot water loads. Freeze protection is provided by drain down. Solar energy is stored underground in a 2000-gallon insulated tank. City water is circulated through a heat exchanger in the storage tank for preheating before entering a gas-fired boiler which supplies DHW on demand. When solar energy is insufficient to satisfy the space heating load, the gas-fired boiler provides auxiliary energy for space heating. The system, shown schematically in Figure 1, has four modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the collector plate temperature exceeds the storage temperature by 17°F and terminates when a temperature difference of 3°F is reached. Collector loop pump P1 is operating.

Mode 2 - Storage-to-Space Heating: This mode activates when there is a space heating demand and the temperature at the top of the storage tank is 105°F or higher. Space heating pump P2 is operating and mode diversion valves V1 and V2 divert the flow to the heat exchanger in the storage tank and bypass the gas-fired boiler.

Mode 3 - Auxiliary Space Heating, DHW Preheating: This mode activates when there is a space heating demand and the temperature at the top of the storage tank is less than 105°F. Space heating pump P2 is operating and mode diversion valves V1 and V2 direct the flow through the gas-fired boiler and bypass the heat exchanger in the storage tank.

Mode 4 - DHW Preheating: This mode activates when there is a demand for DHW. Incoming city water passes through the heat exchanger in the storage tank on the way to the gas-fired boiler which supplies hot water, on demand, to the apartments.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied during the month of March, and the solar energy system operated continuously during the month. Solar energy satisfied 52 percent of

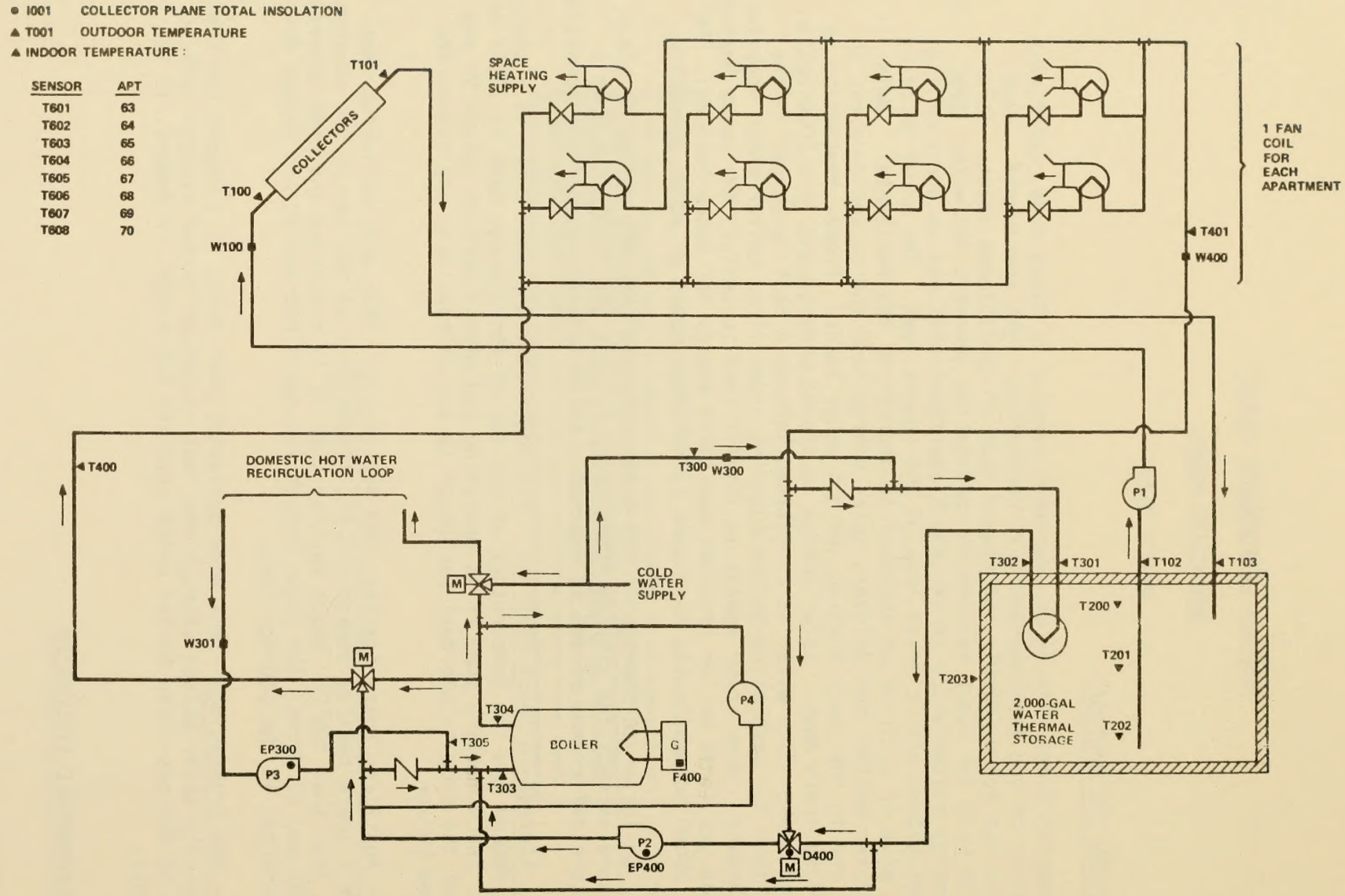

Figure 1. MONTECITO PINES APARTMENTS SOLAR ENERGY SYSTEM SCHEMATIC

the DHW requirements and 11 percent of the space heating requirements. The solar energy system provided fossil fuel energy savings of 13.1 million Btu at an expense of 0.50 million Btu of electrical energy.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 34.3 million Btu for a daily average of 1163 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during March of 1669 Btu per square foot for a plane facing 22 degrees west of south with a tilt of 45 degrees to the horizontal. The average ambient temperature during March was 50°F as compared with the long-term average for March of 53°F. The number of heating degree-days for the month (based on a 65°F reference) was 451, as compared with the long-term average of 381.

THERMAL PERFORMANCE

System - During March the solar energy system performed slightly poorer than expected. The expected performance resulted from a modified f-chart analysis using measured weather and subsystem loads as inputs. Solar energy collected was 10.0 million Btu versus an estimated 10.3 million Btu. Solar energy used by the system was estimated by assuming that all energy collected would be applied to the load. Actual solar energy used was 7.9 million Btu. System total solar fraction was 22 percent versus an estimated 25 percent.

Collector - The total incident solar radiation on the collector array for the month of March was 34.3 million Btu. During the period the collector loop was operating, the total insolation amounted to 28.9 million Btu. The total collected solar energy for the month of March was 10.0 million Btu, resulting in a collector array efficiency of 29 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 8.8 million Btu. Energy loss during transfer from the collector array to storage was 1.2 million Btu. This loss represented 12 percent of the energy collected. Operational energy required by the collector loop was 0.50 million Btu.

Storage - Solar energy delivered to storage was 8.8 million Btu. There were 8.3 million Btu delivered from storage to the DHW and space heating subsystems. Energy loss from storage was 0.31 million Btu. This loss represented 4 percent of the energy delivered to storage. The storage efficiency was 96 percent: This is calculated as the ratio of the sum of the energy removed from storage and the change in stored energy, to the energy delivered to storage. The average storage temperature for the month was 99°F.

DHW Load - The DHW subsystem consumed 4.7 million Btu of solar energy and 5.5 million Btu of auxiliary thermal energy (equivalent to 6.8 million Btu of auxiliary fossil fuel energy) to satisfy a hot water load of 9.0 million Btu. The solar fraction of this load was 52 percent. Losses from the DHW subsystem were 1.2 million Btu. The DHW subsystem consumed a total of 0.70 million Btu of operating energy. A daily average of 499 gallons of DHW were consumed at an average temperature of 133°F delivered from the tank.

Space Heating Load - The space heating subsystem consumed 3.1 million Btu of solar energy and 28.3 million Btu of auxiliary thermal energy (equivalent to 35.4 million Btu of auxiliary fossil fuel energy) to satisfy a space heating load of 27.0 million Btu. The solar fraction of this load was 11 percent. Losses from the space heating subsystem were 4.5 million Btu. The space heating subsystem consumed a total of 2.2 million Btu of operating energy.

OBSERVATIONS

Sensor anomalies still exist in the space heating subsystem and the auxiliary fossil fuel energy supply.

ENERGY SAVINGS

The solar energy system provided a total fossil fuel energy savings of 13.1 million Btu at an expense of 0.5 million Btu of electrical energy. The DHW subsystem provided fossil fuel energy savings of 7.9 million Btu, while the space heating subsystem contributed a fossil fuel energy savings of 5.2 million Btu.

III. ACTION STATUS

Plans have not been formulated to correct the identified sensor anomalies at this site.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-79/03
REPORT PERIOD: MARCH,1979

SITE/SYSTEM DESCRIPTION:
MONTECITO PINES IS AN APARTMENT COMPLEX WITH EIGHT INSTRUMENTED UNITS. THE SOLAR ENERGY SYSTEM PROVIDES SPACE HEATING AND DOMESTIC HOT WATER. THE COLLECTION STORAGE LOOP USES WATER FOR THE ENERGY TRANSFER AND STORAGE MEDIUM. WATER FOR DOMESTIC HOT WATER USE PASSES THROUGH A HX IN THE STORAGE TANK AND THEN THROUGH A GAS FIRED BOILER IN THE DHW RECIRC. LOOP. WATER FOR SPACE HEATING CIRCULATES THROUGH THE STORAGE TANK HX OR THROUGH THE GAS FIRED BOILER AND IS AVAILABLE TO INDIVIDUAL APARTMENTS ON DEMAND.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	34.256	MILLION BTU
	36059	BTU/SQ.FT.
COLLECTED SOLAR ENERGY	9.953	MILLION BTU
	10477	BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	50	DEGREES F
AVERAGE BUILDING TEMPERATURE	69	DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.23	
ECSS OPERATING ENERGY	0.496	MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	3.354	MILLION BTU
TOTAL ENERGY CONSUMED	55.454	MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL	
LOAD	9.014	26.983	N.A.	35.997	MILLION BTU
SOLAR FRACTION	52	11	N.A.	22	PERCENT
SOLAR ENERGY USED	4.719	3.142	N.A.	7.861	MILLION BTU
OPERATING ENERGY	0.699	2.159	N.A.	3.354	MILLION BTU
AUX. THERMAL ENERGY	5.469	28.310	N.A.	33.689	MILLION BTU
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.	N.A.	MILLION BTU
AUX. FOSSIL FUEL	6.837	35.388	N.A.	42.111	MILLION BTU
ELECTRICAL SAVINGS	0.000	0.000	N.A.	-0.496	MILLION BTU
FOSSIL SAVINGS	7.865	5.236	N.A.	13.101	MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.676

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-79/03
REPORT PERIOD: MARCH,1979

SITE/SYSTEM DESCRIPTION:
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GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	36.140	GIGA JOULES
	409483	KJ/SQ.M.
COLLECTED SOLAR ENERGY	10.501	GIGA JOULES
	118980	KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	10	DEGREES C
AVERAGE BUILDING TEMPERATURE	21	DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.23	
ECSS OPERATING ENERGY	0.523	GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	3.539	GIGA JOULES
TOTAL ENERGY CONSUMED	58.504	GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	9.509	28.468	N.A.	37.977 GIGA JOULES
SOLAR FRACTION	52	11	N.A.	22 PERCENT
SOLAR ENERGY USED	4.978	3.315	N.A.	8.293 GIGA JOULES
OPERATING ENERGY	0.738	2.278	N.A.	3.539 GIGA JOULES
AUX. THERMAL ENG	5.770	29.867	N.A.	35.541 GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
AUX. FOSSIL FUEL	7.213	37.334	N.A.	44.427 GIGA JOULES
ELECTRICAL SAVINGS	0.000	0.000	N.A.	-0.523 GIGA JOULES
FOSSIL SAVINGS	8.297	5.524	N.A.	13.822 GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.676

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SOLAR HEATING AND CCCLING DEMCNSTRATION PROGRAM

MONTHLY REPORT
ENERGY CCLLECTICN AND STORAGE SUBSYSTEM (ECSS)

SITE: MCNTECITO PINES SANTA ROSA, CA SOLAR/1045-79/03
REPORT PERIOD: MARCH,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LCADS MILLICN ETU	AUX THERMAL TC ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	1.988	43	0.341	N	0.026	N	0.155
2	0.344	44	0.120	O	0.002	O	0.348
3	0.412	50	0.080	T	0.007	T	0.195
4	0.558	52	0.141		0.013		0.253
5	1.598	56	0.302	A	0.026	A	0.158
6	1.886	60	0.381	P	0.027	P	0.154
7	1.851	58	0.662	P	0.026	P	0.301
8	1.115	56	0.483	L	0.019	L	0.388
9	0.512	51	0.203	I	0.009	I	0.391
10	0.305	53	0.149	C	0.000	C	0.489
11	0.882	50	0.147	A	0.028	A	0.166
12	1.914	54	0.293	B	0.028	B	0.133
13	0.101	50	0.162	L	0.000	L	1.577
14	0.269	53	0.140	E	0.000	E	0.522
15	0.309	49	0.104		0.003		0.338
16	0.299	44	0.093		0.002		0.312
17	1.688	46	0.082		0.025		0.049
18	1.010	48	0.182		0.017		0.180
19	2.030	50	0.476		0.027		0.239
20	1.729	52	0.464		0.022		0.251
21	0.214	49	0.191		0.000		0.889
22	0.490	50	0.108		0.006		0.220
23	1.546	53	0.147		0.028		0.095
24	2.057	51	0.524		0.028		0.333
25	1.844	50	0.583		0.026		0.284
26	0.288	49	0.159		0.000		0.554
27	0.527	50	0.130		0.008		0.247
28	1.431	49	0.171		0.023		0.119
29	1.450	48	0.283		0.023		0.179
30	1.456	47	0.509		0.020		0.312
31	2.156	50	0.470		0.027		0.195
SUM	34.256	-	8.279	N.A.	0.496	N.A.	-
AVG	1.105	50	0.267	N.A.	0.016	N.A.	0.229
NBS ID	G001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-79/03
REPORT PERIOD: MARCH,1979

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	1.988	1.865	0.644	51	0.324
2	0.344	0.040	0.008	51	0.024
3	0.412	0.240	0.086	52	0.208
4	0.558	0.389	0.146	55	0.261
5	1.598	1.505	0.615	69	0.385
6	1.886	1.794	0.624	72	0.331
7	1.851	1.757	0.598	73	0.323
8	1.115	0.981	0.352	64	0.316
9	0.512	0.363	0.122	56	0.239
10	0.305	0.000	0.000	56	0.000
11	0.882	0.827	0.287	59	0.325
12	1.914	1.829	0.672	68	0.351
13	0.101	0.000	0.000	50	0.000
14	0.269	0.000	0.000	55	0.000
15	0.309	0.066	0.018	51	0.059
16	0.299	0.030	0.010	46	0.035
17	1.688	1.577	0.631	53	0.374
18	1.010	0.785	0.275	55	0.272
19	2.030	1.917	0.639	63	0.315
20	1.729	1.610	0.519	61	0.300
21	0.214	0.000	0.000	51	0.000
22	0.490	0.174	0.053	53	0.108
23	1.546	1.445	0.525	65	0.340
24	2.057	1.949	0.643	67	0.313
25	1.844	1.666	0.524	63	0.284
26	0.288	0.000	0.000	52	0.000
27	0.527	0.266	0.079	52	0.149
28	1.431	1.247	0.439	56	0.306
29	1.450	1.292	0.454	58	0.313
30	1.456	1.315	0.402	*	0.276
31	2.156	2.008	0.589	64	0.273
SUM	34.256	28.937	9.953	-	-
AVG	1.105	0.933	0.321	58	0.291
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-79/03
REPORT PERIOD: MARCH, 1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.596	0.341	0.148	102	0.822
2	0.003	0.120	-0.096	100	9.410
3	0.066	0.080	-0.034	95	0.704
4	0.112	0.141	-0.060	93	0.722
5	0.557	0.302	0.205	100	0.909
6	0.567	0.381	0.156	111	0.946
7	0.536	0.662	-0.006	115	1.224
8	0.292	0.483	-0.144	108	1.160
9	0.092	0.203	-0.092	101	1.199
10	0.000	0.149	-0.148	94	1.000
11	0.205	0.147	0.031	91	0.864
12	0.613	0.293	0.214	100	0.827
13	0.000	0.162	-0.154	99	1.000
14	0.000	0.140	-0.135	90	1.000
15	0.009	0.104	-0.057	84	5.225
16	0.006	0.093	-0.088	80	0.956
17	0.582	0.082	0.394	90	0.818
18	0.234	0.182	-0.027	102	0.660
19	0.590	0.476	0.060	107	0.908
20	0.460	0.464	-0.002	108	1.004
21	0.000	0.191	-0.153	99	1.000
22	0.037	0.108	-0.042	92	1.780
23	0.455	0.147	0.223	99	0.813
24	0.582	0.524	-0.019	110	0.869
25	0.447	0.583	-0.019	108	1.261
26	0.000	0.159	-0.151	98	1.000
27	0.059	0.130	-0.065	91	1.093
28	0.373	0.171	0.123	95	0.788
29	0.417	0.283	0.053	101	0.804
30	0.357	0.509	0.047	105	1.559
31	0.533	0.470	0.029	109	0.936
SUM	8.781	6.279	0.190	-	-
AVG	0.283	0.267	0.006	99	0.964
NBS ID	G200	G201	G202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: MONTECITO PINES SANTA ROSA, CA SOLAR/1045-79/03
REPORT PERIOD: MARCH,1979

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.198	55	0.109	0.023	0.138	N	0.172	0.000	0.182	59	136	328
2	0.207	58	0.120	0.022	0.122	O	0.153	0.000	0.199	58	131	345
3	0.162	49	0.080	0.022	0.104	T	0.130	0.000	0.134	62	133	272
4	0.313	45	0.141	0.022	0.204		0.255	0.000	0.235	57	130	524
5	0.292	50	0.146	0.023	0.169	A	0.211	0.000	0.243	59	132	532
6	0.280	64	0.178	0.024	0.171	P	0.214	0.000	0.296	61	135	441
7	0.364	62	0.227	0.025	0.244	P	0.305	0.000	0.379	60	138	576
8	0.257	58	0.148	0.024	0.224	L	0.280	0.000	0.247	62	137	441
9	0.358	55	0.196	0.022	0.195	I	0.244	0.000	0.326	60	132	598
10	0.317	47	0.149	0.022	0.125	C	0.157	0.000	0.249	60	132	545
11	0.314	47	0.147	0.022	0.174	A	0.218	0.000	0.245	60	132	534
12	0.284	49	0.138	0.023	0.208	B	0.260	0.000	0.231	62	135	486
13	0.277	56	0.156	0.022	0.151	L	0.189	0.000	0.259	61	131	491
14	0.328	43	0.140	0.022	0.206	E	0.257	0.000	0.234	61	132	567
15	0.289	36	0.104	0.022	0.192		0.240	0.000	0.174	61	130	525
16	0.324	29	0.093	0.022	0.221		0.276	0.000	0.155	59	130	580
17	0.209	40	0.082	0.022	0.138		0.172	0.000	0.137	64	133	370
18	0.305	59	0.182	0.022	0.119		0.149	0.000	0.303	60	134	510
19	0.306	57	0.174	0.023	0.183		0.229	0.000	0.291	61	134	510
20	0.290	58	0.169	0.023	0.210		0.262	0.000	0.281	62	136	495
21	0.327	58	0.191	0.022	0.135		0.168	0.000	0.318	60	129	608
22	0.241	45	0.108	0.022	0.149		0.186	0.000	0.180	62	132	425
23	0.288	51	0.147	0.022	0.120		0.150	0.000	0.245	61	132	501
24	0.317	62	0.196	0.023	0.184		0.230	0.000	0.327	62	136	512
25	0.367	65	0.240	0.023	0.272		0.340	0.000	0.399	60	134	605
26	0.299	53	0.159	0.022	0.151		0.189	0.000	0.265	60	131	521
27	0.290	45	0.130	0.022	0.191		0.238	0.000	0.217	61	129	536
28	0.357	48	0.171	0.022	0.216		0.270	0.000	0.285	62	132	634
29	0.284	54	0.155	0.022	0.181		0.226	0.000	0.258	63	132	506
30	0.317	60	0.189	0.023	0.198		0.248	0.000	0.316	61	136	528
31	0.254	60	0.153	0.023	0.173		0.217	0.000	0.255	61	136	418
SUM	9.014	-	4.719	0.699	5.469	N.A.	6.837	0.000	7.865	-	-	15463
AVG	0.291	52	0.152	0.023	0.176	N.A.	0.221	0.000	0.254	61	133	499
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: MONTECITO PINES — SANTA ROSA, CA — SOLAR/1045-79/03
REPORT PERIOD: MARCH, 1979

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.988	19	0.200	0.071	0.988	N	1.235	0.000	0.333	66	43
2	1.249	0	0.000	0.070	1.719	O	2.149	0.000	0.000	67	44
3	0.792	0	0.000	0.070	1.133	T	1.416	0.000	0.000	68	50
4	0.783	0	0.000	0.070	1.031		1.289	0.000	0.000	69	52
5	0.537	19	0.106	0.071	0.548	A	0.685	0.000	0.177	71	56
6	0.360	28	0.112	0.071	0.447	P	0.558	0.000	0.187	72	60
7	0.374	84	0.330	0.072	0.087	P	0.109	0.000	0.550	72	58
8	0.505	52	0.284	0.071	0.313	L	0.391	0.000	0.473	71	56
9	0.710	0	0.004	0.070	1.147	I	1.434	0.000	0.007	70	51
10	0.890	0	0.000	0.069	0.798	C	0.997	0.000	0.000	71	53
11	0.882	0	0.000	0.069	0.973	A	1.216	0.000	0.000	70	50
12	0.641	18	0.117	0.070	0.552	B	0.690	0.000	0.195	70	54
13	0.878	0	0.004	0.070	1.099	L	1.374	0.000	0.006	70	50
14	0.793	0	0.000	0.069	0.937	E	1.171	0.000	0.000	70	53
15	1.119	0	0.000	0.068	1.328		1.660	0.000	0.000	70	49
16	1.269	0	0.000	0.065	1.338		1.672	0.000	0.000	69	44
17	1.148	0	0.000	0.069	1.229		1.536	0.000	0.000	69	46
18	1.052	0	0.000	0.069	1.089		1.361	0.000	0.000	68	48
19	0.944	32	0.311	0.070	0.679		0.849	0.000	0.518	69	50
20	0.683	39	0.265	0.070	0.475		0.593	0.000	0.442	69	52
21	1.047	0	0.000	0.069	1.291		1.614	0.000	0.000	70	49
22	0.851	0	0.000	0.069	1.068		1.335	0.000	0.000	69	50
23	1.121	0	0.000	0.069	0.953		1.192	0.000	0.000	70	53
24	1.147	42	0.488	0.071	0.572		0.715	0.000	0.813	70	51
25	1.111	25	0.284	0.069	0.683		0.854	0.000	0.473	69	50
26	0.894	0	0.000	0.069	1.112		1.390	0.000	0.000	70	49
27	1.074	0	0.000	0.069	1.407		1.759	0.000	0.000	69	50
28	0.769	0	0.000	0.069	1.040		1.300	0.000	0.000	69	49
29	0.939	11	0.105	0.070	1.082		1.353	0.000	0.175	68	48
30	0.805	33	0.265	0.070	0.706		0.882	0.000	0.441	68	47
31	0.625	42	0.268	0.070	0.487		0.608	0.000	0.446	68	50
SUM	26.983	-	3.142	2.159	28.310	N.A.	35.388	0.000	5.236	-	-
AVG	0.870	11	0.101	0.070	0.913	N.A.	1.142	0.000	0.169	69	50
NBS	Q402	N400	Q400	Q403	C401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: MONTECITO PINES — SANTA ROSA, CA — SOLAR/1045-79/03
REPORT PERIOD: MARCH,1979

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	2092	N	43	51	N	N	N
2	362	O	44	51	O	O	O
3	434	T	50	52	T	T	T
4	587		52	55			
5	1682	A	56	69	A	A	A
6	1985	P	60	72	P	P	P
7	1948	P	58	73	P	P	P
8	1173	L	56	64	L	L	L
9	539	I	51	56	I	I	I
10	322	C	53	56	C	C	C
11	928	A	50	59	A	A	A
12	2015	B	54	68	B	B	B
13	106	L	50	50	L	L	L
14	283	E	53	55	E	E	E
15	325		49	51			
16	314		44	46			
17	1777		46	53			
18	1063		48	55			
19	2137		50	63			
20	1820		52	61			
21	226		49	51			
22	516		50	53			
23	1627		53	65			
24	2165		51	67			
25	1941		50	63			
26	303		49	52			
27	555		50	52			
28	1506		49	56			
29	1527		48	58			
30	1532		47	*			
31	2269		50	64			
SUM	36059	N.A.	-	-	-	-	-
AVG	1163	N.A.	50	58	N.A.	N.A.	N.A.
NBS ID	G001		N113			N115	N114

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